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USNRC

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'98 MAY -4 P2:42

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)

CONAM INSPECTION, INC.
Itasca, Illinois)

(Order Imposing Civil Monetary Penalty))

OFFICE OF SECRETARY
RULEMAKING AND
ADJUDICATIONS STAFF
Docket No. 30-31373-CIVP
ASLBP No. 98-735-01-CivP

RESPONSE TO NRC STAFF INTERROGATORIES
TO CAROL D. BERGER
CONSULTANT TO CONAM INSPECTION, INC.

Interrogatory Number 1: Identify and set forth at length and in detail any and all changes, modifications, or any other alterations of any sort, which should be made to your letter dated December 10, 1996, addressed to Mr. Robert Slack, R.S.O., Conam Inspection Inc., and to Appendix A through D, and their Attachments, which are attached to the aforesaid letter, to make the letter and Appendix A through D and their attachments complete, true and correct as of the date of the answer to this interrogatory.

Response: The December 10, 1996 letter and Appendix A through D and their attachments are complete, true and correct as written.

Interrogatory Number 2: Are you professionally and technically conversant with the NRC Standards for Protection Against Radiation set forth in Title 10, Part 20 of the Code of Federal Regulations?

Response: I am professionally and technically conversant in the requirements of 10 CFR 20 for the following reasons. I am Certified in the comprehensive practice of Health Physics by the American Board of Health Physics. I have applied the basic principles in 10 CFR 20 to radiation protection program development, appraisal, upgrade, and support for more than 20 years. For the past 13 years, I have assisted numerous USNRC (and Agreement State) licensees in achieving and demonstrating compliance with 10 CFR 20 (or the Agreement State equivalent). I have also prepared and delivered training programs in dose assessment methods to a variety of technical and agency groups. (In particular, I prepared and delivered a 40-hour Internal Dosimetry Course to USNRC inspectors at the Technical Training Center in Chattanooga, Tennessee, and I prepared and delivered a 16-hour Skin Dosimetry Course to USNRC inspections at the various regional offices. Both courses addressed non-uniform irradiation of the body.) In addition, I am familiar with the fundamental principles that form the regulations in 10 CFR 20, having served on a variety of consensus standards committees tasked with applying those principles for dose assessment purposes.

Interrogatory Number 3: Are you professionally and technically competent to apply the NRC's dose computation methodology as set forth in Part 20 of

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the Code of Federal Regulations and, given sufficient information, to calculate the dose received externally to an individual?

Response: For the reasons set forth in my response to Interrogatory Number 2, I am professionally and technically competent to assess radiation doses for the purpose of comparison with the dose limits in 10 CFR 20. However, it is important to note that 10 CFR 20 does not provide specific dose calculation methodologies from measurement results. Instead, it provides dose limits and definitions of terms that comprise the dose limits. I have performed many such dose assessments using the definitions and terms in 10 CFR 20, most of which were reviewed and approved by the USNRC or an applicable Agreement State agency.

Interrogatory Number 4: Did you calculate Mr. William Chastain's external doses, which are set forth in Attachments 1 and 2 of Appendix D in your report of December 10, 1996, as 2347.01 and 2535.24, respectively, in full compliance with the methodology required for calculating an external dose as set forth in 10 CFR Part 20?

Response: Title 10, Code of Federal Regulations, Part 20, Section 1003 (10 CFR 20.1003) defines the total effective dose equivalent (TEDE) as the sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures). The same section defines the deep-dose equivalent as the dose equivalent at a tissue depth of 1 cm (1000 mg/cm²) from external whole body exposure [emphasis added]. Using conventional dose assessment methodologies and the recommendations of consensus standards agencies, I determined that the most likely estimate of deep-dose equivalent incurred by Mr. Chastain, exactly as defined in 10 CFR 20.1003, was either 2,347 millirem or 2,535 millirem, depending upon the time-and-motion scenario, and disregarding the discrepancy between the exposure scenarios and the film badge results. Since no committed effective dose equivalents from internal sources occurred, the most likely TEDE incurred by this individual for the two scenarios was 2,347 or 2,535 millirem, respectively.

However, conflicting instructions appear in 10 CFR 20.1201(c). In this subsection, the regulation states that "The assigned deep-dose equivalent and shallow-dose equivalent must be for the part of the body receiving the highest exposure".¹ This definition is not only in conflict with the 10 CFR 20.1003 definition for deep-dose equivalent, but it is also inconsistent with the fundamental principles of dose

¹ With respect to the term "shallow dose equivalent", the USNRC recognized that non-homogeneous irradiation of small areas of the skin results in doses that are not directly comparable to the skin dose limit in 10 CFR 20.1201(a)(2)(ii). This is why the 10 CFR 20.1003 definition for shallow-dose equivalent limits the area of skin over which the dose is averaged to a minimum of one (1) square centimeter. In a 1990 Policy Statement, the USNRC acknowledged that, while doses to smaller areas of the skin may exceed the USNRC's skin dose limit, the predicted effect cannot be compared to that from uniform radiation of the skin (55 FR 3113, "Enforcement Policy Regarding Occupational Doses from 'Hot Particles,' Policy Statement", July 31, 1990). Thus the USNRC permits the licensee to average the skin dose over a one (1) square centimeter area for compliance purposes.

limitation promulgated by the International Commission on Radiological Protection in Publication 26, the document that forms the basis for 10 CFR 20 and Federal Radiation Guidance.' The USNRC recognized this limitation and thus, in the 10 CFR 20.1003 definition for "weighting factor", provided licensees with the ability to apply external dose weighting factors in order to compare the risk of stochastic effects resulting from non-uniform irradiation to the total risk of stochastic effects when the whole body is irradiated uniformly.

By assessing the dose to that area of the body that received the highest exposure, by applying weighting factors taken from a consensus standard (ANSI N13.41), and by submitting a description of the approach and the results obtained for Conam submission to the USNRC for approval (see Conam's April 9, 1997 response to the USNRC's March 10, 1997 Demand for Information), my dose assessment complied with the letter and the intent of the USNRC's regulations in 10 CFR 20.

Interrogatory Number 5: Are the estimated external doses (in millirem) set forth in the Interrogatory immediately above, the numerical figures which would result from calculating the total effective dose equivalent received by Mr. William Chastain in accordance with the methodology set forth in 10 CFR Part 20?

Response: Yes. See the response to Interrogatory Number 4 for the basis of this conclusion.

Interrogatory Number 6: For purposes of calculating external dose, does 10 CFR Part 20 permit a licensee to use weighting factors for external exposures prior to obtaining NRC approval?

Response: In 10 CFR 20.1003, footnote 2 to the table entitled "Organ Dose Weighting Factors", it states that "The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued". Nowhere in this citation does it state that pre-approval is necessary. On the other hand, in 10 CFR 20.1204(c)(2), which specifically addresses internal exposure, the USNRC states that "when specific information on the physical and biochemical properties of the radionuclides taken into the body or the behavior or the material in an individual is known, the licensee may upon prior approval of the Commission [emphasis added] adjust the DAC or ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material (e.g., aerosol size distribution or density)." Likewise, in 10 CFR 20.1703(d), which specifically addresses the use of respiratory protection, the USNRC states that "The licensee shall notify, in writing, the Regional Administrator of the appropriate NRC Regional Office listed in appendix B to part 20 at least 30 days before the date [emphasis added] that respiratory protection equipment is first used under the provisions of either §20.1703(a) or (b)." Both of these citations clearly advise the licensee that prior approval for

² 52 FR 2822, "Radiation Protection Guidance to Federal Agencies for Occupational Exposure", January 27, 1987.

these actions is necessary. They show that USNRC regulations explicitly require prior approval when it is deemed necessary. Such explicit direction does not appear in footnote 2 of 10 CFR 20.1003. Therefore, prior approval for using weighting factors to assess deep dose equivalent from non-uniform fields is not required.

Interrogatory Number 7: For purposes of calculating external dose, does 20 CFR Part. 20 permit a licensee to use draft or final American National Standards Institute (ANSI) document number HPS N13.41-1997, "Criteria for Performing Multiple Dosimetry," for determining external exposures prior to obtaining NRC approval?

Response: In 10 CFR 20, the USNRC neither approves nor disapproves the use of HPS N13.41-1997 for assessing external exposures. (See response to Interrogatory Number 6 in regard to the "prior approval" issue associated with this Interrogatory.) Likewise, 10 CFR 20 neither approves nor disapproves of the use of ANSI N13.14, HPS N13.42, or ICRP 54 (for example) for assessing internal exposures, even though the tools contained therein are necessary for interpreting monitoring results, and are routinely used by licensees for internal dose assessments.^{3,4,5}

Interrogatory Number 8: If the answer to Interrogatory number 7 is yes, please describe in detail how you were informed that the NRC had, or would, approve the use of draft or final HPS N13.41-1997 in computing the external dose received by Mr. William Chastain.

Response: When the current version of 10 CFR 20 was issued in 1991, the principal standard-setting organizations had not yet provided specific weighting factors for use in assessing external doses from non-uniform fields, even though the basis for these factors have existed since the 1970's, rendering their derivation a straightforward matter. It was for this reason that the USNRC opted to evaluate the use of external dose weighting factors on a "case-by-case basis" until specific factors were issued by the standard-setting organizations. HPS N13.41 was approved by the ANSI-accredited HPS N13 Committee on June 20, 1996, and the standard was published in final form on December 1, 1996. Because this document contained the first listing of external dose weighting factors that had been approved by a standard-setting agency, and because the basis for the factors was the same as the basis for the factors shown in 10 CFR 20 for internal dose assessment, it was reasonable and prudent to apply the guidance

³ American National Standards Institute, "Internal Dosimetry Programs for Tritium Exposure - Minimum Requirements", ANSI N13.14-1983.

⁴ American National Standards Institute, "Internal Dosimetry for Mixed Fission and Activation Products", HPS N13.42-1997.

⁵ International Commission on Radiological Protection, "Individual Monitoring for Intake of Radionuclides by Workers: Design and Interpretation", ICRP Publication 54, Pergamon Press, New York, 1988.

in this document to the Conam dose assessment rather than deriving and justifying alternative factors.

As chair of the N13.41 committee, I had a fundamental understanding of the technical basis, derivation, and recommended use of the external dose weighting factors that appeared in HPS N13.41. Because consensus-standard factors were used, because no modifications to the factors were made, and because the basis for the factors is ICRP 26/30 (the same standards that form the basis for 10 CFR 20), there was no reason to doubt the USNRC's approval of the use of these factors for assessing the likely TEDE incurred by Mr. Chastain.

Interrogatory Number 9: If the answer to Interrogatory number 7 is yes, please describe in detail how HPS N13.41-1997 is used in accident situations, such as the case with Mr. William Chastain's exposure.

Response: The purpose of HPS N13.41 is to provide guidance for when to monitor with multiple dosimeters and where to place such dosimeters when their use is deemed necessary, and how to interpret and record dosimeter results after they are processed/evaluated. The standard was specifically developed to address non-uniform external exposures, which is at the heart of the Conam matter.

Since multiple dosimeters were not involved in the Conam matter, issues of when and how to use them are not pertinent. However, the way in which the whole body dose is inferred from multiple dosimetry (specifically the use of compartment factors) does have applicability to Conam since, in both the standard and the Conam matter, non-uniform irradiation of the whole body is assumed.

The Standard's reference to accident conditions refers to global conditions wherein the results of dosimetry processing cannot be assumed to be similar to the dose distribution that was assumed when dosimeter placement was initially determined (i.e., the relationship between the dose in a given compartment to the whole body dose may not remain constant over the monitoring period). The standard does not preclude the use of the compartment weighting factors for assessing the effective dose equivalent under any circumstances, accident or routine, if the dose to a compartment can be reasonably estimated (such as was done by Conam in reconstructing the sequence of events).

Interrogatory Number 10: Were you provided any information, in writing or orally, by Conam Inspection, Inc., prior to December 10, that indicated that the NRC had approved, or would approve the use of weighting factors for external exposure in calculating the external dose received by Mr. William Chastain?

Response: No.

Interrogatory Number 11: If the answer to Interrogatory number 10 is yes, please describe in detail, how you were informed that the NRC had, or would, approve the use of weighting factors for the determination of external exposure in computing the dose received by Mr. William Chastain.

Response: Not applicable.

Interrogatory Number 12: If you were informed in any sort of graphic that the NRC had approved, or would approve, the use of weighting factors for external exposure in computing the dose received by Mr. William Chastain, will you voluntarily provide such graphic material to the NRC counsel?

Response: Not applicable.

Interrogatory Number 13: Prior to sending your December 10, 1996 letter to Mr. Robert Slack, did you formally or informally, in detail or simply roughly, calculate what total effective dose equivalent Mr. William Chastain would have received on February 28, 1996, according to the methodology set forth in 10 CFR Part 20?

Response: No. The only dose calculations performed were those that were summarized in my December 10, 1996 letter.

Interrogatory Number 14: If the answer to Interrogatory number 13 is yes, please set forth your computations of the total effective dose equivalent received by Mr. Chastain using the methodology set forth in 10 CFR Part 20.

Response: Not applicable.

Interrogatory Number 15: If the answer to Interrogatory number 13 is yes, did the occupational dose received by Mr. Chastain exceed the annual dose permitted by the NRC in 10 CFR Part 20?

Response: Not applicable.

Interrogatory Number 16: If the answer to Interrogatory number 13 is yes, do you have any written notes, or computer data sheets, showing your calculations in accordance with the NRC methodology set forth in 10 CFR Part 20, and if so will you voluntarily make them available to the NRC counsel?

Response: Not applicable.

Interrogatory Number 17: If the answer to Interrogatory 13 is yes and you do not have any notes or graphic material showing your calculations please describe when, how, and under what circumstances those notes or graphic records were either destroyed or disposed of.

Response: Not applicable.

Interrogatory Number 18: Prior to sending your December 10, 1996 letter and attachments to Mr. Robert Slack, did you calculate the dose which Mr. Chastain received by using a methodology which was in compliance with 10 CFR Part 20 methodology?

Response: Yes. The results of that assessment are described in my December 10, 1996 letter. (See response to Interrogatory Number 4.)

Interrogatory Number 19: If the answer to Interrogatory number 18 is yes, please identify fully just what methodology you used.

Response: The methodology I used is explained in detail in my December 10, 1996 letter.

Interrogatory Number 20: If the answer to Interrogatory number 18 is yes, do you have any notes or computer work sheets showing your calculations?

Response: Yes.

Interrogatory Number 21: If the answer to Interrogatory number 20 is yes, will you voluntarily provide such graphic material to the NRC counsel?

Response: This material is attached to my December 10, 1996 letter.

Interrogatory Number 22: If the answer to Interrogatory number 20 is no, please describe in detail the time and circumstances under which your graphic material was destroyed or disposed of.

Response: Not applicable.

Interrogatory Number 23: Prior to December 10, 1996, did you orally or graphically, directly or indirectly or by inference, inform Mr. Robert Slack, or any person having an interest in common with Conam Inspection Inc., or any of Conam's employees or officers, that computation of the dose received by Mr. William Chastain would exceed permissible NRC occupational dose limits if calculated in accord with the criteria set forth in 10 CFR Part 20?

Response: No.

Interrogatory Number 24: If the answer to Interrogatory number 23 is yes, please describe fully just what that communication was, how it occurred, when it occurred, and to whom it was made.

Response: Not applicable.

Interrogatory Number 25: Prior to December 10, 1996, did any person associated with Conam Inspection, Inc., suggest that you use a particular methodology to calculate the dose that Mr. Chastain received or that you use another methodology to calculate the dose that Mr. Chastain received in a manner that was not approved by the NRC for determination of occupational external exposure?

Response: No.

Interrogatory Number 26: If the answer to Interrogatory number 25 is yes, please describe in detail the conversation, or conversations, which occurred, where computational methodology other than that approved by the NRC, was discussed.

Response: Not applicable.

Interrogatory Number 27: Prior to December 10, 1996, did any person(s) associated with Conam Inspection Inc., inform you directly or indirectly, or by inference, that persons at Conam Inspection, Inc. believed that a

computation of the dose received by Mr. William Chastain did or might exceed the dose permitted by the NRC if it was calculated strictly in accordance with the criteria set forth in 10 CFR Part 20 for determination of external dose?

Response: No. However, Conam representatives did provide me with a copy of the USNRC inspection report, wherein the inspectors' belief that an overexposure occurred was stated.

Interrogatory Number 28: If the answer to Interrogatory number 27 is yes, please identify who was the person associated with Conam Inspection, Inc., when the conversation occurred, and what was the intention and result of the conversation.

Response: Not applicable.

Interrogatory Number 29: Will you voluntarily provide to NRC counsel the written request of November 22, 1996, by Mr. Robert Slack for an assessment of the total effective dose equivalent received by Mr. William Chastain on February 27, 1996.

Response: Yes.

Interrogatory Number 30: Taking all written and oral communications together, were you or Integrated Environmental Management, Inc., engaged to provide an assessment of the external dose received by Mr. Chastain, in accordance with the methodology authorized by the NRC in 10 CFR Part 20?

Response: No.

Interrogatory Number 31: If the answer to Interrogatory number 30 is no, please describe in detail just what you and or Integrated Environmental Management, Inc., were engaged to do.

Response: On November 19, 1996, at 11:32 a.m. (Eastern Time), I received a call from Mr. Robert Slack. I was referred to him by the RSO of another firm. In that call, he informed me of the general circumstances of Mr. Chastain's exposure, that Mr. Chastain's film badge read 4,600 millirem upon processing, that cytogenetic results were inconclusive, and that a USNRC (Region III) inspection report of the incident indicated (1) Mr. Chastain's TEDE was greater than 5,000 millirem, and that Conam did not report the incident immediately. Because the USNRC's dose estimate (from their own reconstruction of the circumstances surrounding this case) differed from the Conam estimate, he asked if I would agree to perform an independent assessment of the radiation dose incurred by Mr. Chastain in order to resolve the discrepancies. The methodology to be used in completing that dose assessment was not discussed. Mr. Slack then forwarded to me the information listed on pages 1 and 2 of my December 10, 1996 letter, along with his transmittal letter of November 22, 1996, which I took to be authorization to proceed with this work.

Interrogatory Number 32: Page 14 of Appendix C of your December 10, 1996 letter to Mr. Robert Slack states: "However, a survey of the exit port of

the camera was not performed at that time." Was this information provided to you by Mr. Slack or someone associated with Conam Inspection, Inc.?

Response: Yes. Mr. Slack provided me with a copy of the USNRC's November 18, 1996 Inspection Report No. 030-31373/96002(DAMS) and Investigation Report No. 3-96-014. The statement that appeared on page 14 of Appendix C of my December 10, 1996 letter referred to section 3.1.2, paragraphs three (3) and five (5) of that report.

Interrogatory Number 33: If the answer to Interrogatory number 32 is yes, please identify who provided the information to you.

Response: See response to Interrogatory Number 32.

Interrogatory Number 34: If the answer to Interrogatory number 32 is yes, did you then, or do you now, have any reason to believe that you were provided with incorrect information by any person associated with Conam Inspection, Inc.?

Response: I have no opinion as to whether the statement in the USNRC's Inspection/Investigation report is correct or not. It was simply taken at face value.

Interrogatory Number 35: If the basic origin of the information, "however, a survey of the exit port of the camera was not performed at that time" was your footnote 24 (ref. letter to Michael Creech from Cynthia Pederson, NRC, dated November 18, 1996), did any person associated with Conam Inspection, Inc., ever, in any way, tell you that information was incorrect?

Response: No. This issue was never discussed.

Interrogatory Number 36: Do you believe that any person associated with Conam Inspection Inc., would have provided you with incorrect factual information or conflicting instructions regarding the exposure of Mr. Chastain and the attending circumstances?

Response: No.

Interrogatory Number 37: Set forth in specific detail, by name, date, method, and substance (what you said and what they said), all communications subsequent to April 9, 1998, which occurred between you and Conam Inspection, Inc., or any person associated with Conam Inspection, Inc., regarding the factual content of any and all of your answers to these Interrogatories.

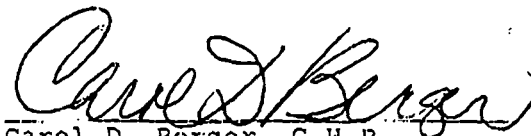
Response: I have not had any conversations with Conam representatives regarding the *factual content* of the Interrogatories. The following are the only discussions I have had with Conam representatives in this regard:

(1) On Thursday, April 16, 1998 at 1:15 p.m. (Pacific Time), I received a call from Clifton Lake, Esq. (McBride Baker & Coles) inquiring as to whether I had received an electronic transmission of information from Charles A. Barth, Esq. (USNRC). I

informed Mr. Lake that I did receive the transmission, that the attachment was unintelligible, and that I was awaiting a "hard" copy from Mr. Barth. Mr. Lake agreed to fax a copy of the transmission to my office. (I was out of town from April 15, 1998 until April 22, 1998.)

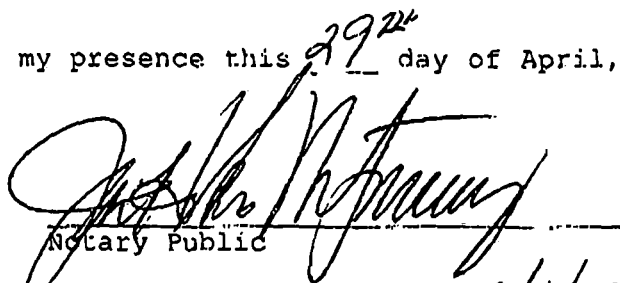
(2) On Thursday, April 23, 1998, at 11: 59 a.m. (Eastern Time), I phoned Mr. Lake to inform him that I had received and reviewed the faxed copy of the Interrogatories, and to solicit instructions on the format of my responses. Mr. Lake provided me with a recommended format.

(3) On Thursday, April 23, 1998 at 2:17 p.m. (Eastern time), I received a call from Mr. Lake informing me that there was a misunderstanding about the date my responses to the Interrogatories were due.


Carol D. Berger, C.H.P.

SWORN TO BEFORE ME and subscribed in my presence this 29th day of April, 1998.




Notary Public
My Commission expires on 2/1/02

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

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'98 MAY -4 P2:42

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

OFFICE OF SECRETARY
RULEMAKINGS AND
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In the Matter of)	
)	
CONAM INSPECTION, INC.)	Docket No. 30-31373-CivP
)	
(Order Imposing Civil Monetary Penalty))	ASLBP No. 98-735-01-CivP

CERTIFICATE OF SERVICE

I hereby certify that copies of **CONAM'S RESPONSE TO NRC STAFF INTERROGATORIES** in the above-captioned proceeding have been served on the following by deposit in the United States Mail, First Class, (also via fax where indicated) this 29th day of April, 1998.

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Clifton A. Lake
Counsel for Conam Inspection, Inc.

Dated: April 29, 1998